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Through the eyes of the Romanian children

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THROUGH THE EYES OF THE ROMANIAN CHILDREN

BY

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Biography

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I am from Valley City, North Dakota. I received a Bachelor of Science degree in Psychology from the University of North Dakota in 1997. I have been involved in Amigos Eyecare and Phi Theta Upsilon fraternity while in optometry school. After I graduate, I hope to return to the Midwest to practice.

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Abstract

An epidemiological screening was performed on 875 Romanian children on a recent eye care trip to Romania. The screening was used to assess the refractive status, binocularity and ocular health anomalies found in Romanian children. The data collected showed that 17.1% of the children had been prescribed glasses prior to the screening. Of the entire 875 children, 17.2% were myopes and 18% were hyperopes.

Children unable to obtain visual acuities of 20/40 or better with both eyes represented approximately 7.3% of the population. Astigmatism exhibited a large bias in gender; the prevalence being 19.9% in females versus 12.4% in males.

Introduction

Many articles have been published which look at the prevalence of ocular anomalies throughout the world. One area of the world for which very little current information exists is Romania.

Much research has been done on school children in the United States. One study don by Lee and Oelrich looked at the prevalence of ocular conditions among Hispanic, white, Asian, and black immigrant students at UCLA. The study included 2,229 newly immigrated students ages 8-16 years of age.[1] The study found differences between race and gender. Lee and Oelrich found that females have a significantly higher rate of astigmatism and myopia. Asians had a 30% prevalence of myopia, which was significantly higher than all other groups. Extraocular muscle imbalance was seen most often among white children, occurring 3.4% of the time. In comparing uncorrected impaired visual acuity, defined as worse than 20/40 in at least one eye, the Asian, white and Hispanic groups had myopic prevalence of 16.5%, 11.8%, and 7.1%. The most frequently found ocular abnormality besides refractive errors was extraocular muscle imbalances including both tropias and phorias.

A massive study on 5.4 million children took place in India by Limburg. The study was done to asses the results of a vision screening program in schools in India 5 years after the program was introduced. Of the 5.4 million children, only 3.8% were referred from the schools for refraction by an ophthalmologist. Spectacles were prescribed to .8% out of the 3.8% referred. Of all ocular morbidity in the total population 14.1% was due to refractive errors of which myopia comprised 1.8% and hyperopia 1.4%.[2] A study done by Lithander assessed the prevalence of strabismus among school children in the sultanate of Oman, and found only 1.34% of the 6541 children in grades 1-6 were strabismic.[3]

Chen looked at the prevalence of ocular disorders among 6 and 7 year olds in Santa Monica, California. The sample consisted of 1469 individuals of whom 48.1% were female and 51.9% were male. His study found that there was a significant difference in gender, with females having a higher percentage of refractive errors than males. Overall, out of the 1469 subjects, 18.5% had refractive errors. In the group, 5.7% of the subjects had visual acuities of 20/50 or worse. The refractive error data pointed to a higher number of hyperopes, 6.9% compared to 3.7% myopes. The study also looked at astigmatism and found 12.4% of the group to have significant astigmatism.[4]

Mantyjarvi performed a study on 1,118 Finlandian children ages 7-15. Two hundred-sixty were hyperopic and 828 were myopic.[5] Laatikainen and Erkkila also performed a study on Finlandian school children . Their study consisted of 411 five to seven year olds. They found a general shift away from hyperopia towards myopia as the children increased in age. Of the 411 subjects in their study, 4.6% exhibited strabismus.[6]

Another study from the U.S. done by Scheiman at Pennsylvania College of Optometry looked at 2023 patients between 6 months and 18 years of age. In their subgroup of 6-18 year olds, they found 23% were hyperopic, 20.2% were myopic, and 22.5% had significant astigmatism.[7]

An epidemiologic study of ocular refraction done by Lin among school children in Taiwan showed a high prevalence of myopia among the 11,178 students tested. There was a significant increase in myopia as the children's age increased. At age 6 it was 12%, increasing to 56% by age 12 and then to 76% at 15. An unbelievable 84% were myopic at 16-18 years of age. By age 18 the mean refractive errors was –3.92 diopters in girls and –2.7 diopters in boys.[8]

Another study in India by Kalikivayi was done on 4029 children. The study included 2348 males and 1681 females from 3-18 years old. Prevalence of hyperopia was 22.6%, myopia 8.6%, and astigmatism 10.3%.

The prevalence of myopia was significantly higher among children 10 years of age or older.[9]

Kathy Hendrickson of Pacific University completed a study specifically on the Romanian population in 1999. Epidemiological information was collected on 690 children and 190 adults. Hendrickson found that 45% of the children were emmotropic, 27% were myopic, and 28% were hyperopic. She found with the rule astigmatism to have the highest occurrence when compared to other axis orientations. She also found that 8% of the population had no stereopsis.[10] This study was done on a similar population to further investigate Hendrickson's data.

Methods

Eight hundred seventy-five Romanian children from orphanages and schools were selected as subjects for the study. Temporary clinics were set up in Turnu Roiu and Talmaciu where refractive status, binocularity, and ocular health were screened. Nine Pacific University optometry students and four optometrists performed the screening, assisted by local residents who helped with translation. All the students in grades K-6 were seen at the Talmaciu school as well as all the children living in the Talmaciu and Turnu

Rosa orphanages. The vision exam was broken up into a series of stations with the optometry students and optometrists administrating the visual tests. At the first station, each subject was registered by a translator and a case history was performed. Distance visual acuity was tested using the picture and snellen charts at the second station. Visual acuities were taken through the patients habitual vision. After the distance acuities were recorded, unilateral and alternating cover tests were performed at a 20 foot distance with the patient fixating on a 20/40 snellen letter. At this time, a phoria or tropia was measured. At the third station, a Retinomax autorefractor was used to measure the patients' refractive status. All hyperopes were found cyclopeged with 1% cyclopentolate and then reassessed with the autorefractor. Patients with unreliable autorefractor results and low visual acuity were retested with a lens bar and a retinoscope. Station four consisted of a series of near tests. Near visual acuity was taken using a Snellen or picture chart depending on whether or not the child could read letters or not. Findings were recorded in Snellen fraction form. Binocularity was tested using both the Lang stereoacuity card and the stereofly sequence. Ocular motility and near point of convergence were done at near point range using colored beads on a wand. Station five consisted of checking ocular health and pupils with a direct ophthalmoscope. The anterior segment evaluation

included examining the lids, cornea, conjunctiva, and iris. The posterior segment evaluation included the neural rim tissue, C/D ratio, foveal light reflex, optic disc margins, and color. Pupils were assessed for diameter, direct and consensual responses, and on afferent pupillary defect. After all the testing was completed, all subjects who met the referral criteria(Table 1) were referred to the special testing station. Here, their problems were further investigated and treated appropriately. If surgery was indicated, the patient was referred to a visiting United States ophthalmologist, who was planning on visiting Romania sometime after we performed the screening. At station six, donated glasses were dispensed to the children who needed them. Glasses were matched as close as possible to the subject's prescription by one of the clinicians. All the glassed were sorted, cleaned, verified, and catalogued according to lens power and gender style by members of the Amigos Eye Care organization prior to leaving for Romania.

Table 1. Referral criteria for the entire screening process.

Condition	Procedure	**Criteria for Referral**
Distance Visual Acuity	Snellen Chart	20/30 or poorer, either eye
Refractive Error	Autorefractor or Retinoscopy	
Hyperopia		+1.50 or greater
Myopia		-0.75 or greater with acuity loss
Astigmatism		1.00D or more
Anisometropia		1.00D or more
Eye Posture (Distance)	Cover Test	
Tropia		Any tropia
Esophoria		5^ or more
Exophoria		10^ or more
Hyperphoria		2^ or more
Ocular Motilities	Bead Skills	Any anomalies
Saccades		
Pursuits		
Extraocular Muscles		EOM restriction or nystagmus
Convergence		Break 10 cm / recovery 18 cm
Stereoacuity	Lang Stereo Card	No stereo acuity

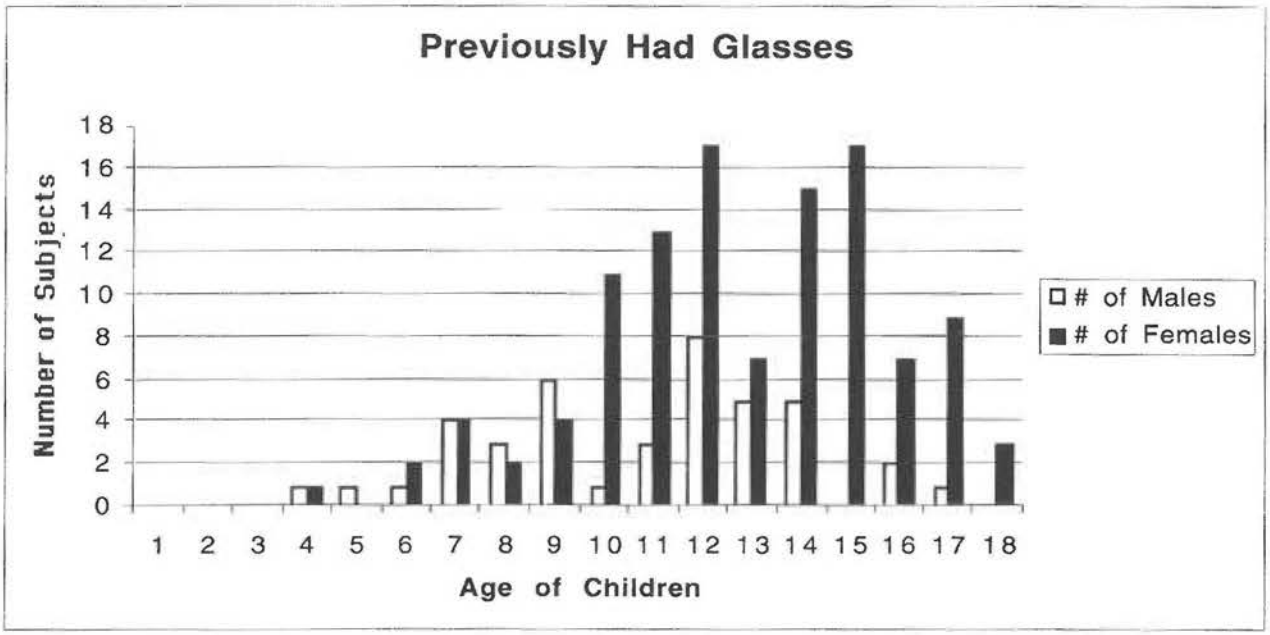
Results

Previously Had Glasses

Of the 875 children that we screened, 17.1% of them already had glasses or had previously owned a pair. Between the sexes the number varied significantly; only 4.1% of the males previously had glasses

compared to 12.8% of the females. Ages ranged from 4-18 years old with 66.67% of those owning glasses being 10-15 years old. The distribution of those previously owning glasses is shown in figure 1.

Figure 1. Describes the number of children with previously prescribed correction according to their age and gender.

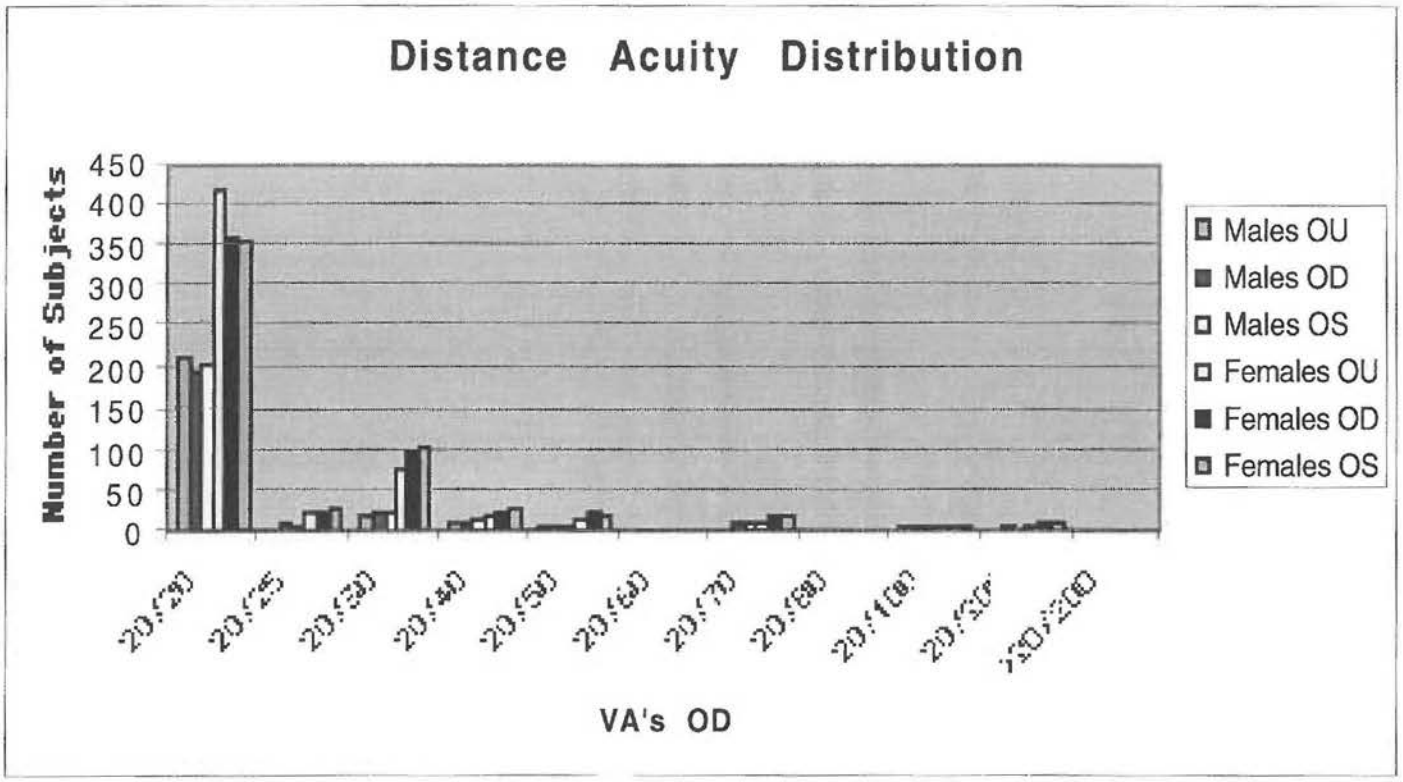


Distance Acuity

Acuities ranged from 20/15 to 20/200, with 76% of the children reaching 20/20 OU. The monocular results varied with only 66.7% of the children reaching 20/20 with OD and 67.3% reaching 20/20 with OS. Only

7.3% of the children had acuities of 20/40 or worse when using both eyes in the distance.

Figure 2. Visual acuity results at distance through right eye only.

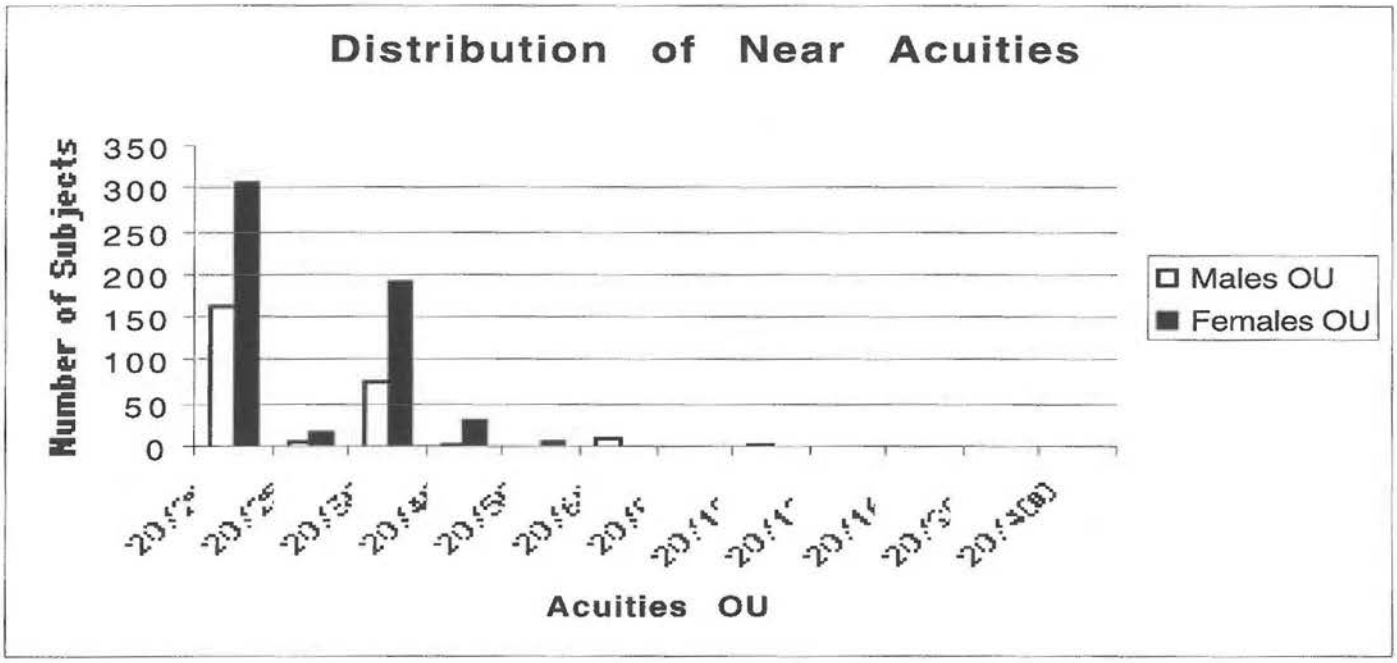


Near Acuities

The children's near acuities ranged from 20/20 to 20/400. Of the 830 children that we were able to obtain near VA's on, 56.8% were able to see 20/20. The rest of the children fell into the 20/30 range with 32.7% reading

the 20/30 line. Only 7.1% of the children had VA's less than or equal to 20/40 OU at near.

Figure 3. Visual acuities at near performed through both eyes.

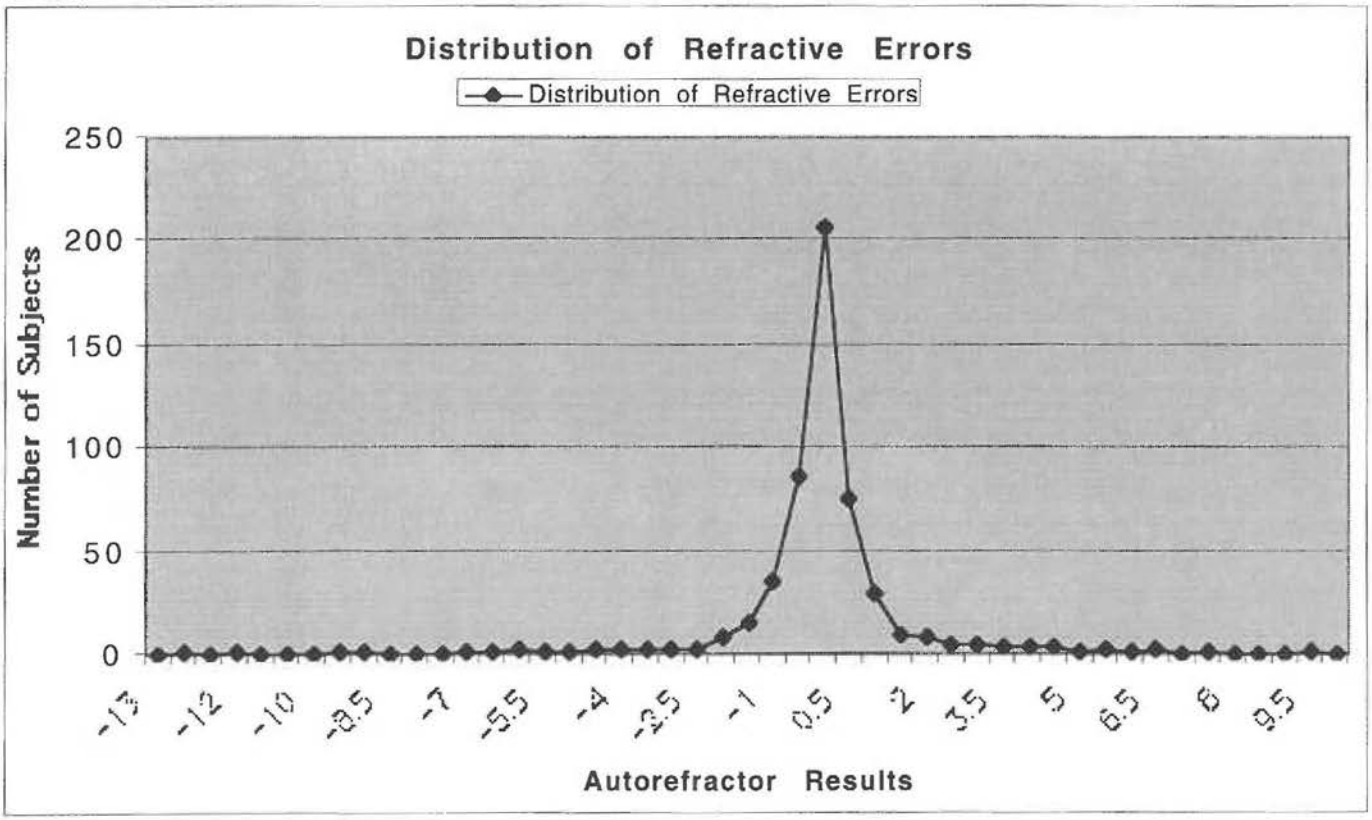


Refractive Data

Refractive data were collected from 872 subjects (Fig 4). There were 275 male patients and 597 females. An autorefractor was used to find the sphere powers. Emmetropia was defined as -0.50 to +0.50 diopters. The mean right eye sphere power was +.015 diopters for the girls and -.017 diopters for the boys. Sixty six percent of the males were considered emmetropic. Sixty four percent of the females were considered emmetropic. The hyperopes

numbered 17.2% of the population and the myopes 13.9%. Of the hyperopes, 14.6% of the females and 9.0 % of the males had +1.00 diopters or greater of hyperopia. Of the myopes, 11.7% of the females and 18.2% of the males had –1.00 diopters or more of myopia. (Fig 4).

Figure 4. Spherical values derived from Autorefractor. Includes OD results only.



Astigmatism

For the right eye, 17.5% of the children tested had astigmatism. Astigmatism was exhibited by 12.4% of the males and 19.9% of the females. The dioptric range of astigmatism was from –0.50 to –4.00 diopters (Fig 4). Of the children tested, 8.1% had a with-the-rule astigmatism (axis between 1-30 or 151-180 degrees), 1.7% had an against-the-rule astigmatism (axis between 60-120 degrees), and 7.7% of the children had an oblique astigmatism (axis between 31-59 or 121-149 degrees). All astigmatisms noted were on the children's right eyes. The frequency distribution of the with-the rule, against-the rule, and oblique astigmatism as seen in figure 5.

Figure 5. Indicates the distribution of WTR cylinder in the entire population based on Autorefractor results on OD only.

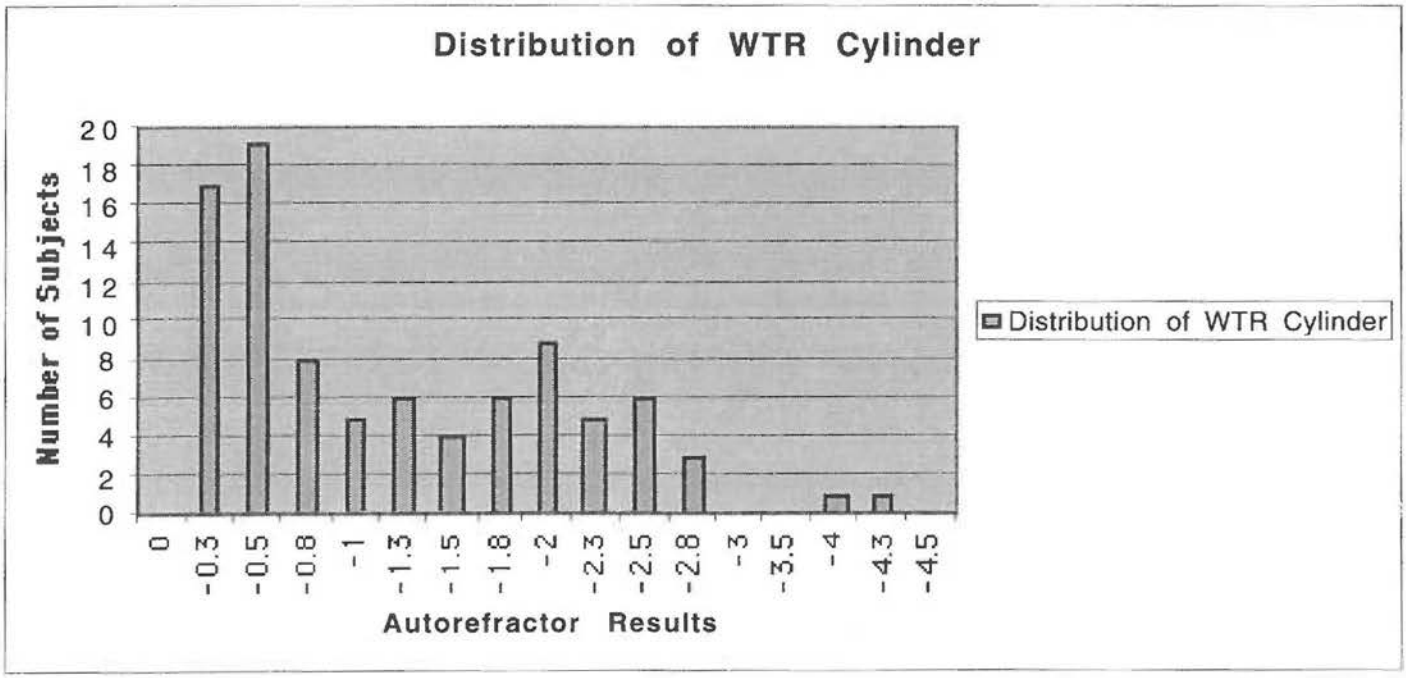


Figure 6. Indicates the distribution of ATR cylinder in OD only. Based on Autorefractor results.

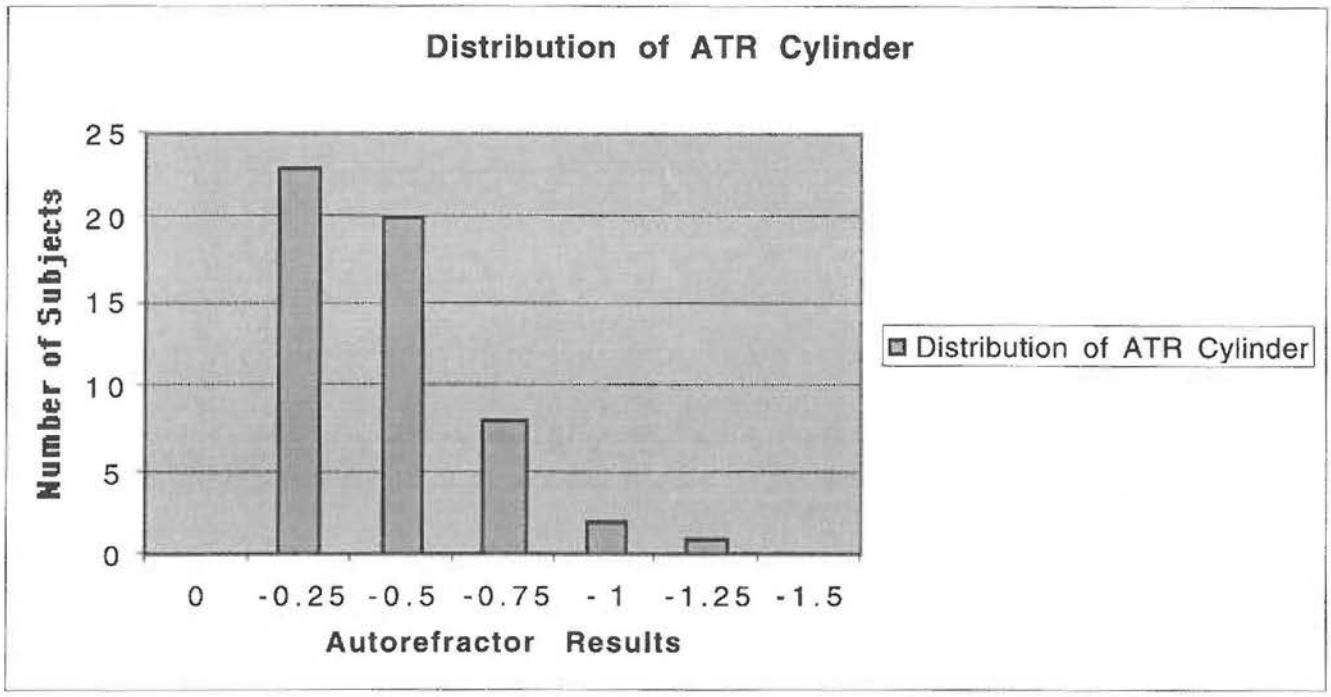
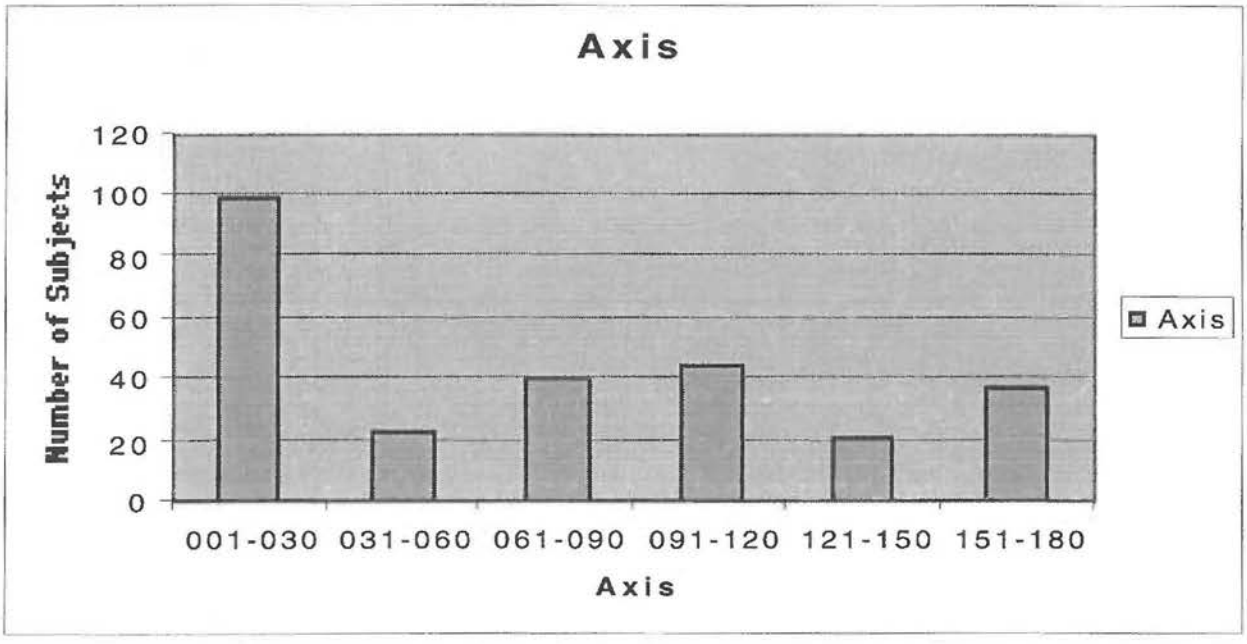


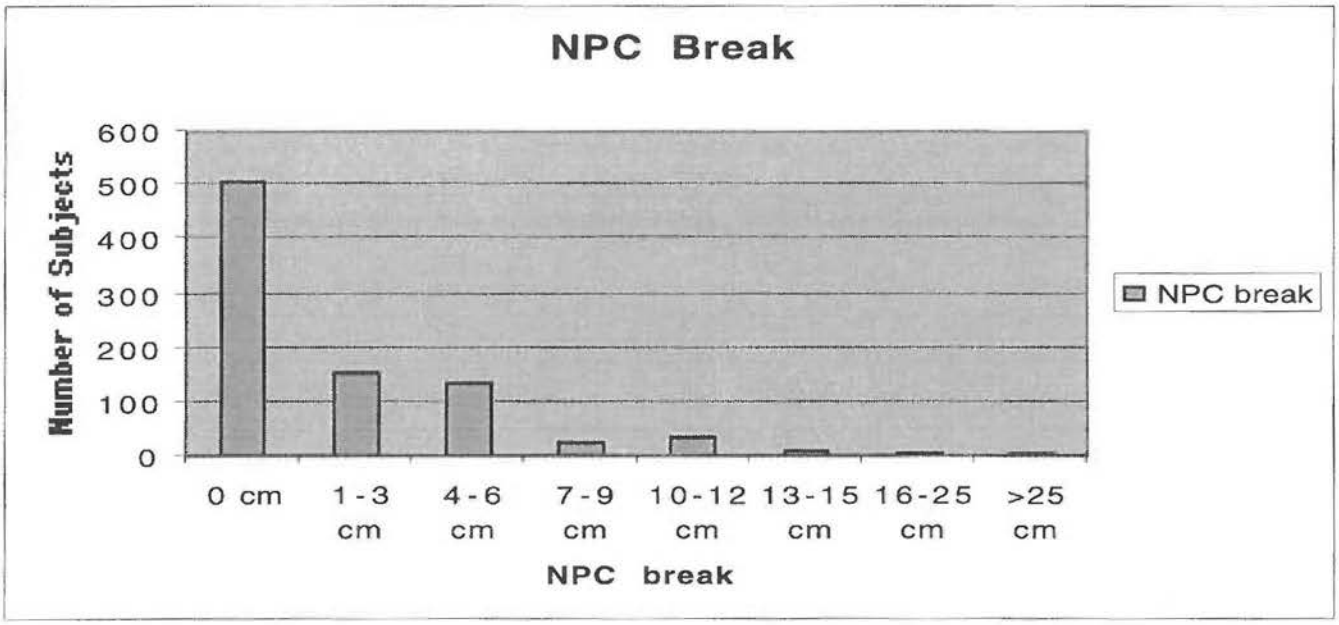
Figure 7. Autorefractor results showing the cylinder axis distribution.



Near point of Convergence

The near point of convergence breaks ranged from 0 to 40 centimeters. Of the children tested, 90.6% fell between 0 and 6 centimeters. Figure 8 shows the frequency of the NPC breaks.

Figure 8. Distribution of the nearpoint of convergence results. Only breaks are listed.



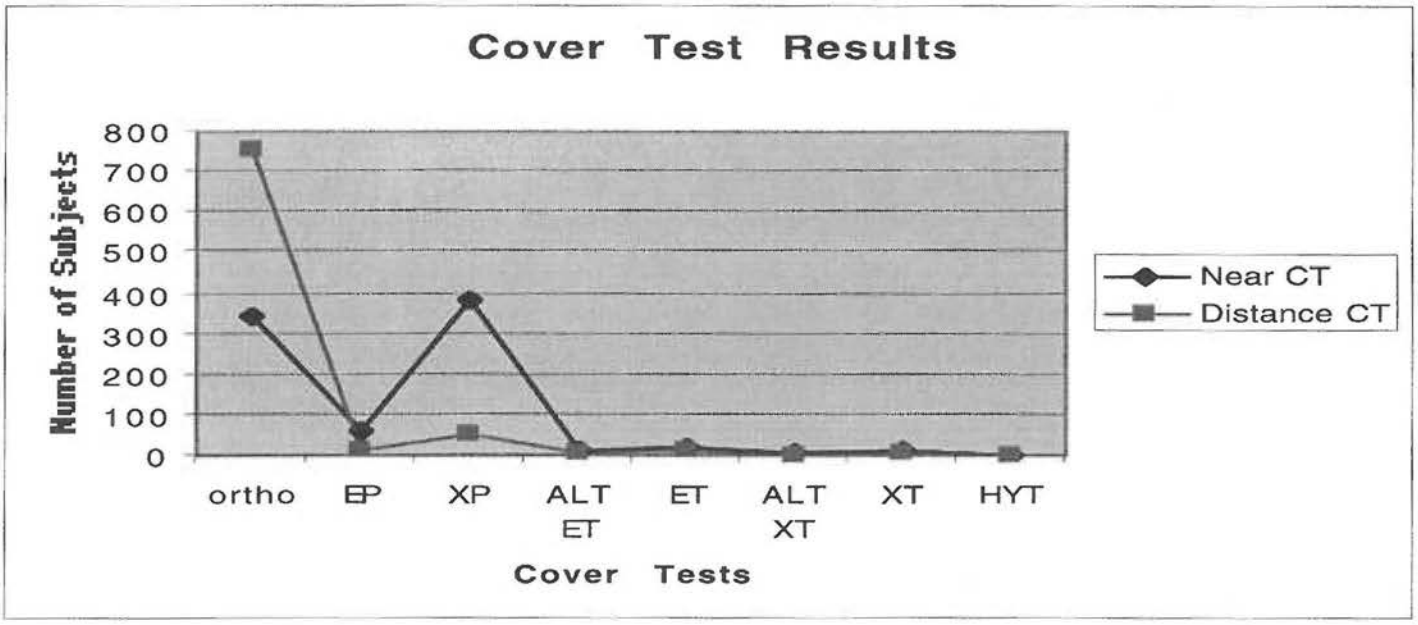
Motility

Eight and one half percent of the children did not pass the motility test. Failure was based on the referral criteria in Table 1.

Phorias and Tropias at Distance

Forty one percent of the children were orthophoric, 7.1% were esophoric, 45.7% were exophoric, 1.3% were esotropic, 0.6% were exotropic, 0.2% were hypertropic, 1% were alternating esotropes, and 0.1% were alternating exotropes. (Figure 9).

Figure 9. Results of cover testing at both far and near.

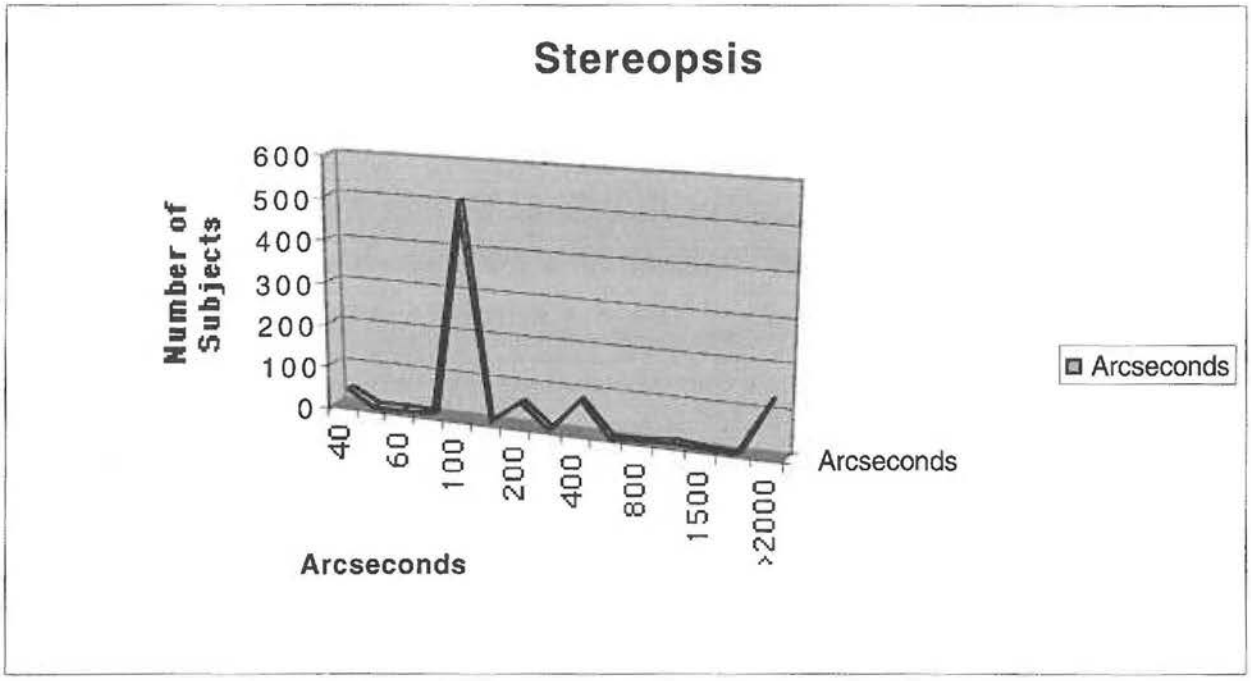


Stereopsis

On stereopsis testing, 15% of children had 2000 arc seconds or worse of stereoability. A significant number of children, 65.6%, had 100 arcseconds or better of stereoability. (Fig 10). The majority of the subjects are in the

100 arc second range because this was an accepted end point to stereo testing in the screening.

Figure 10. Stereopsis results using both Lang and Stereofly.



Dispensing

A total of 197 pairs of glasses were dispensed. Eighty-seven percent were plus lenses and 13% were minus lenses. Twenty-two and a half percent of the children screened needed a lens prescription.

Ocular Health

Of all the children tested, only 1.37% had any ocular health problems.

Table 2. Describes the various ocular health anomalies that the team observed within this population.

Ocular Health Problem	Age
APD	12
Blepharitis	7
Cataract	16
Cataract/Microcornea	11
Chalazion	10
Corneal Trauma	13
Effervescent white dot syndrome	10
Elevated, blurred optic nerve head	13
Retinal Detachment	17
Retinal Hemorrhage	10
RPE disruption due to choroidal rupture	15
Large cup	16

Discussion

During our trip to Romania, we screened 875 children ranging from one to eighteen years of age. Five hundred ninety seven were females and

275 were males. Of the 875 children screened, 17.1% had previously been prescribed glasses prior to our arrival. There was a difference between genders with the chance of females having owned glasses being three times as much as in males. Of the children tested, 7.3% had 20/40 acuity or worse OU. In Chang and Wheelers study on 6-7 year old children in Santa Monica, California, similar results were found showing that 5.7% of their population had VA's of 20/50 or worse.

In a similar study done by Lee and Oelrich on their prevalence of ocular conditions among Hispanic, white, Asian immigrant students, it was found that 16.5% of Asians, 11.8% of whites, and 7.1% of Hispanics manifested 20/40 VA's or worse OU.[1] The prevalence of myopia among the children was 17.2%.

Myopia was defined as being –0.75 diopters and above. The prevalence of hyperopia was 18.0%, and was defined as being +0.75 diopters or greater. These findings differ significantly from a previous study on Romanian children by Hendrickson published in 1999 who found 27.5% of the subjects were myopic and 28% were hyperopic.[10] Our data, which was compared to a similar population, showed a significantly lower prevalence of both myopia and hyperopia. This could possibly be due to a higher number of subjects seen. Our study more closely parallel the study done be

Lee and Oelrich. Our data show that 17.5% of the children had 0.50 diopters or more of astigmatism. There was a significant difference in gender with males having astigmatism 12.4% of the time and females 19.9% of the time. This finding correlates to Lee and Oelrich who found a significantly higher prevalence of astigmatism in females. Hendrickson's study showed that 15.6% of the Romanian children had a cylindrical component to their refractive error. This slightly reduced number of astigmatic patients can be explained by her criteria of astigmatism which only included 1.00 diopters or more of astigmatism compared to our study which included .50 diopters and above.

Strabismus among the children totaled 5.5% with 1.8% being exotropic and 3.7% being esotropic.. This finding is slightly lower than a study done on Finlandian children by Laatikainen and Erkkila in 1979.5 Their study found 4.6% of 5-7 year olds to be strabismic. This lower percentage could be do to our study seeing twice as many subjects or different testing techniques. In a study based solely on the prevalence of strabismus among school children in the Sultanate of Oman, Lithander found only 1.3% of the children to be strabismic. This variation among regions of the world could possibly be due to genetics, race, or testing techniques. Our study found that 15% of the Romanian children tested showed 2000 arc

seconds or worse of stereoability. One hundred arc seconds or better was attained by 65.6% of the subjects. Hendrickson found an 8% prevalence of no stereoability. This difference could possibly be due to the two studies using different stereopsis tests.

During our testing of Romanian children, we prescribed 197 pairs of glasses which was 22.5% of all the children screened. In Limburg's study of school children in India, only 0.8% were prescribed spectacles. His study was based upon school screenings which had been performed by a teacher. This resulted in only 3.8% of the students being referred to an ophthalmologist. The children in our study exhibited a very low incidence of ocular health anomalies; however, this was exactly what we expected based on the age of the population screened.

Conclusion

In conclusion, this study on Romanian children compared relatively well to similar studies performed throughout the world. Through this study we were able to provide vision care to a large number of children. The study shows that it is beneficial to perform vision screenings on children at an early age to prevent detrimental effects of visual anomalies on a child's educational

and overall life experience. Although we were able to examine many children in the orphanages and schools that we visited, it is clear that there is still a need for further vision care in other regions of Romania.

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